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QST Issue: Apr 1958

Title: Half-Size Ground-Plane Antenna for 10 Meters, A

Author: Philip E. Hatfield, W9GFS

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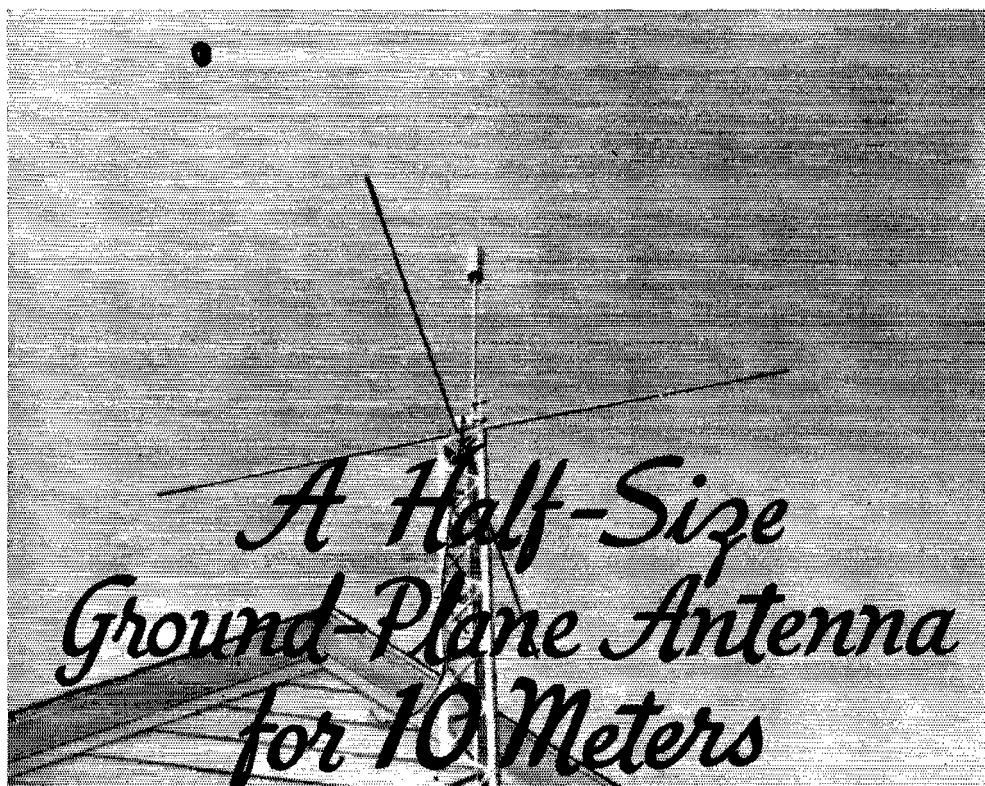
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End-Loaded Elements for Compact, Self- Supporting Construction

BY PHILIP E. HATFIELD,* W9GFS

FOR several years I have maintained a crystal-controlled receiver and companion low-power transmitter on ten meters for the purpose of working the local mobile stations. The antenna used was, until recently, a coaxial vertical constructed of thin-wall conduit and aluminum downspout. Unfortunately, it was one of a number of masts and antennas that, with their associated guy wires, made lawn-mowing a difficult problem. To reduce the clutter, I decided to mount as many antennas as possible on one

unguyed mast, resting on the ground and fastened to the side of the house. When I thought of topping the mast with sixteen feet of unguyed thin-wall conduit and downspout, I decided that the ten-meter antenna would have to be made smaller.

The present popularity of coil-loaded antennas immediately suggested that form of construction; however, no logical method of coil-loading the sleeve of a coaxial antenna presented itself. Since vertical polarization was required, the ground plane seemed the next best choice for coil loading. A hasty search of the literature turned up one loaded ground plane—a broadcast station antenna. With this encouragement, work was started.

A number of eight-foot lengths of $\frac{5}{8}$ -inch o.d. aluminum tubing and some bakelite tubing of $\frac{3}{4}$ -inch o.d. that would fit snugly over the aluminum tubing were available; this automatically determined some of the dimensions of the antenna. It appeared likely that one-piece opposing radials, consisting of eight-foot lengths of tubing, end loaded, would be easier to mount than separate four-foot lengths of tubing with center loading. With this in mind, a $6\frac{1}{2}$ -inch long piece of bakelite tubing (maximum length available in the junk box) was slipped for a distance of $\frac{1}{2}$ inch on each end of an eight-foot section of aluminum tubing, the bakelite forms filled with

*c/o General Electric Co., Owensboro, Ky.

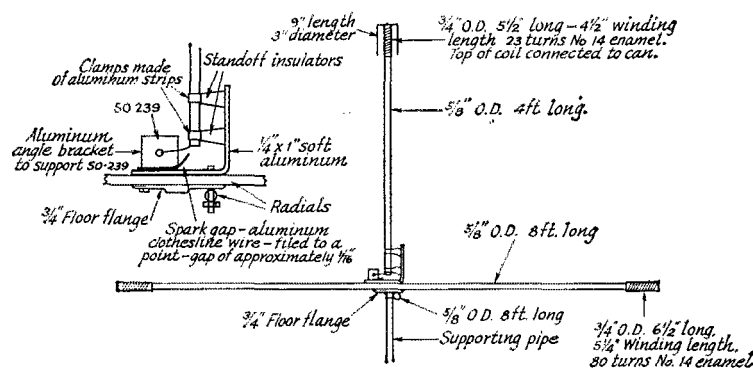
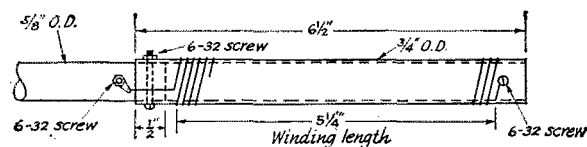
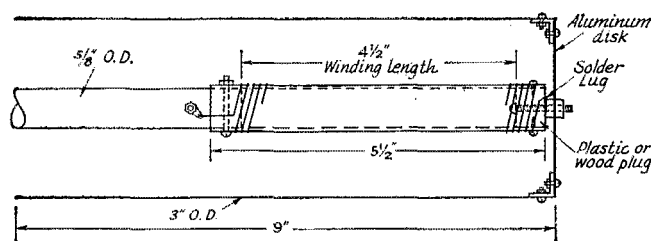


Fig. 1 — Construction details of the half-size ground-plane antenna.



DETAILS - RADIAL LOADING COIL



DETAILS - VERTICAL ELEMENT LOADING COIL

a single layer of enameled copper wire, and the resonant frequency of the combination checked with a grid-dip meter. After trying several wire sizes, No. 14 was selected as the size that would just fill the winding space and produce resonance at 28 Mc. This frequency was chosen to allow pruning of the coils after the antenna was assembled. Two of these elements were constructed and then attention was turned to the vertical element.

A four-foot section of the 5/8-inch o.d. aluminum tubing was selected for the vertical element. A 5 1/2-inch length of the bakelite tubing was slipped for a distance of 1/2 inch on the end and a number of coils wound and checked with a grid-dip meter. The thought occurred that some form of capacitive top-loading would reduce the number of turns on the coil and hence some of the losses. Disks, spokes, and cans were tried, with the final choice being a can made from a 9-inch length of 3-inch diameter aluminum downspout, left over from the construction of the coaxial vertical and saved for years.

Assembly and Tuning

The antenna was assembled by using a 3/4-inch

pipe floor flange as a base and mounting the two coil-loaded eight-foot sections of aluminum tubing at right angles to each other, one on the top surface of the flange and the other on the bottom. Galvanized bolts 1/4 inch in diameter were used as fasteners through holes drilled in the aluminum tubing and the existing holes in the floor flange. The vertical section was attached to the top of the flange with insulators and a right-angle bracket, made from do-it-yourself aluminum, using two of the same bolts that held the horizontal elements in place. A small aluminum plate, carrying an SO-239 coaxial connector, was fastened to the bracket holding the vertical element, and a short length of wire was run from the bottom end of the element to the connector. The construction of the antenna was completed by installing a spark-gap made from a piece of aluminum wire filed to a point on one end, grounded to the flange at the other, and bent to within approximately 1/8-inch of the vertical element.

Tuning of the antenna was achieved by measuring the v.s.w.r. on the RG-58/U cable first used to feed it and then removing turns from the

(Continued on page 150)

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editor of *Skywave*, the newsy publication of the South Shore Amateur Radio Club, Inc. Reports from all parts of our section are solicited to enable your SCM to present a column of general interest to all. Traffic: VE2DR 75, ATL 54, ATQ 1.

ALBERTA—SCM, Sydney T. Jones, VE6MJ—Since this will be my last report as your SCM I would like to take this opportunity to thank all who have contributed to the overall effort during the past ten years. I deeply appreciate the honor of serving as your elected leader for such a long time. I shall always remember the wonderful support given by the faithful few. I wish my successor every good fortune and assure him of my wholehearted support. EA is now active on 144 Mc. TG has a new DX-100. HM has snagged some rare DX. Traffic: (Jan.) VE6HM 218, OD 26, SS 7, TG 7, TT6, PV 4, EJ 3.

MANITOBA—SCM, James A. Elliott, VE4IF—The first meeting for this year of the ARLM Inc., shows promise of a full and active year with many contests and outings planned. Awards will be given for various phases of ham activities, so turn out, gang, and get the dope. ER has been in and out of the hospital again. CB is the NYL of ER. Welcome to the ranks. LS has been convalescing from an operation. EF has been busy with many conventions and curing; and will have the big rig back on the air soon. MP's NYL was hurt in an accident while on her way to code class. HB is back on the air after a long illness. KN was a recent visitor to Winnipeg. She has a DX-100 on the air. CP has had trouble with the new rig, but he will be back on soon. SA and SH have been DXing on 10 meters. SA, BP and VJ are working out well on 10- and 20-meter phone. TJ has a new 3-band rotary. The press has been inquiring about hams picking up satellites. Let's get going, gang, and give them some news. Traffic: (Jan.) VE4QD 60, JY 12, GE 9, RR 9, VJ 9, KN 7, AN 6, EG 6, GF 4, JW 4, RB 4, LU 2, VX 2, WR 2, VESYR 2.

High Power on 220

(Continued from page 18)

monly available in hardware stores, would make a more beautiful, but probably not more effective, shield cover. The cover should be in place when tuning operations are done; otherwise radiation losses are excessive. It is advisable to make preliminary adjustments at reduced drive, as the screen current may be excessive in initial tuning phases. The need for constant metering of the screen current cannot be overemphasized.

Normally the amplifier is run at 1250 volts on the plate, drawing about 200 ma. This is well below the rated maximum for the tube, but it supplies all the signal I have use for. Screen current runs between 8 and 15 ma. Grid current of 10 to 15 ma. is adequate. The amplifier worked smoothly from the first, with no bugs of any kind.

Ground-Plane Antenna

(Continued from page 29)

coil in the vertical element until a minimum value of v.s.w.r. was achieved. As this mini-

(Continued on page 152)

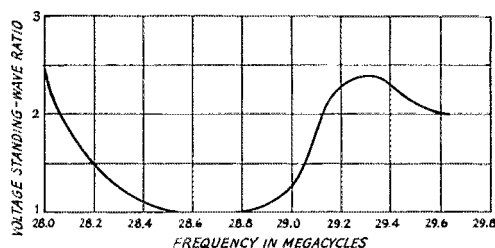
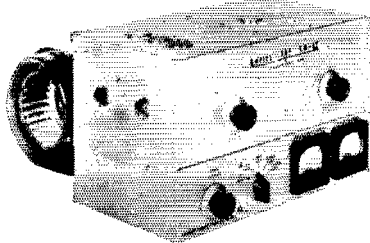


Fig. 2—Standing-wave ratio vs. frequency after adjustment of the loading coil in the vertical element and installing a 52-ohm quarter-wave matching section between the base of the antenna and the 75-ohm transmission line.

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imum value was 2 to 1, use of a matching system was indicated. The matching section chosen was a quarter-wave length of RG-8/U coaxial line (5 feet 8 inches), inserted between the antenna and the RG-59/U cable finally used for the feed line.

The graph of v.s.w.r. versus frequency, while not to be taken too seriously because of the crude nature of the bridge used for obtaining it, indicates that satisfactory operation should be possible over a large portion of the ten-meter band. It is conceivable that greater band width could have been achieved by varying the inductance of the loading coils on the radials, but the desire to get the antenna erected and working overcame any urge to further experimentation.

No concrete comparison of this antenna with the coaxial vertical which it replaced can be made, but local mobile coverage seems to be about the same with the two antennas.

Oh yes, neighbors occasionally ask me when the rocket is to be fired!

Happenings of the Month

(Continued from page 61)

original comments may be filed within ten days from the last day for filing original comments or briefs. No additional comments may be filed unless (1) specifically requested by the Commission, or (2) good cause for the filing of such additional comments is established. The Commission will consider all such comments that are submitted before taking action in these matters and if any comments appear to warrant the holding of a hearing or oral argument, a notice of the time and place of such hearing or oral argument will be given.

8. In accordance with the provisions of Section 1.761 of the Commission's Rules and Regulations, an original and three copies of all statements, briefs, or comments shall be furnished the Commission.

FEDERAL COMMUNICATIONS COMMISSION

MARY JANE MORRIS
Secretary

APPENDIX

IT IS PROPOSED TO AMEND SECTION 12.91 (b) OF PART 12 OF THE COMMISSION'S RULES, AMATEUR RADIO SERVICE, IN THE FOLLOWING PARTICULARS:

Delete the text of Section 12.91 (b), (b) (1), and (b) (2), and insert the following language:

(b) When outside the continental limits of the United States, its territories, or possessions, an amateur radio station may be operated as portable or mobile only under the following conditions:

(1) Operation may not be conducted within the jurisdiction of a foreign government except pursuant to, and in accordance with express authority granted to the licensee by such foreign government. When a foreign government permits Commission licensees to operate within its territories, the amateur frequency bands which may be used shall be as prescribed or limited by that government. (See Appendix 4 of this Part for the text of treaties or agreements between the United States and foreign governments relative to reciprocal amateur radio operation.)

(2) When outside the jurisdiction of a foreign government: operation may be conducted within Region 2 on any amateur frequency band between 7.0 Mc. and 14.8 Mc. inclusive; and when not within Region 2, operation

(Continued on page 154)